It Is All Connected

In order to understand how organisms function in an ecosystem, students must understand how altering ecosystems affects those organisms. To this end, it is important to introduce humans as consumers of ecosystem products.

When people alter ecosystems, they affect the organisms that live there. Intended changes, such as cutting of trees or building roads, often have unintended consequences. Cutting trees may result in loss of food or shelter for wildlife. Building roads may cause runoff and loss of stream habitat.

As people have moved into the Sierra Nevada Mountains, they have affected many of the organisms living there. In Lesson 4, students view before and after pictures of forest ecosystems that are being used (consumed) by humans. Discussions focus on how humans consume goods (matter) produced by natural systems and the types of byproducts generated by their consumption.

Background

The habitat in the Sierra Nevada Mountains has changed significantly over the past 200 years. The most obvious changes are due to logging. Logging is done for a number of reasons important to people: for timber; to clear land for roads, freeways, and housing; for mining, recreation, agriculture, and more. These forms of consumption have many effects—some obvious and some unintended—on wildlife in an ecosystem.

In the past, there was little regulation of logging, but today California has many regulations intended to ensure future supplies of wood and to reduce the effects of logging on forest organisms.

Sometimes logging practices call for clear-cutting, while selective cutting is used at other times. These different timber harvesting practices have different effects on the ecosystem. With clear-cutting, where all trees in a stand are removed at once, logging equipment is brought in only every 40 to 60 years, allowing time for habitat recovery. This practice is sometimes more profitable.

Learning Objective

Identify and describe byproducts generated by the human consumption of goods (matter) produced by natural systems (ecosystems).

Selective cutting means removing individual trees or groups of trees from a forest stand. This method leaves a greater diversity of habitat but involves more frequent re-entry with heavy equipment. Sometimes trees left for future harvesting are subject to being blown down because they have lost the protection of the trees surrounding them.

In addition to the direct effects of forest practices, some of these practices produce **byproducts** that influence the transfer of matter through natural systems. For example, when trees are cut for lumber products, tree limbs and tops are generally left in the forest where they may be a fire hazard or they may be compressed to form erosion-reducing ground cover.

Organisms are influenced both directly and as a result of the byproducts and influences of **human practices**. They generally respond to changes in the ecosystems in which they live in one of three ways: they move, adapt, or die. For instance, if the trees in a forest are cut down and no longer offer protection, animals might move to new forests. However, this option is not available to plants, and the newly arriving animals face competition from those already living in their new habitat.

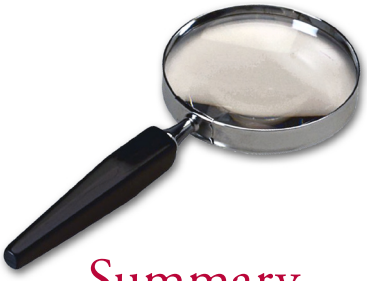
Key Vocabulary

Byproduct: An incidental product that results from human or natural system processes (e.g., materials remaining after manufacturing).

Human practices: The ways that individual people, communities and societies do things.

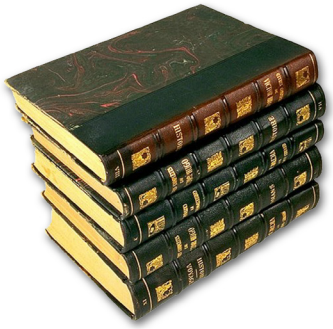
Land use: How a piece of land is used such as forestry, farming, manufacturing, habitat protection

Toolbox



Summary of Activities

Students view before and after pictures of forested areas where human practices brought about changes. They discuss the changes in the ecosystems and the effects of those changes on the ecosystem. They also identify some of the unintended byproducts of logging practices.



Instructional Support

See Unit Resources, page 21

Prerequisite Knowledge

- Students should understand that organisms are interdependent.
- They should be aware that food web relationships demonstrate the interdependence among organisms.
- They should be able to identify examples of products made from wood logged in the Sierra Nevada Mountains.

Advanced Preparation

Produce transparencies:
Make the **Before and After** (Lesson 4 Visual Aid) transparencies

Materials Needed

Transparency of **Before and After**

Visual Aids

Transparencies:
Before and After, page 110

Duration

Preparation time:
20 min.
Instructional time:
45 min.

Safety Notes

None

Activity Masters

No activity masters are used in this lesson.

Procedures

Step 1

Using the **Before and After** (Lesson 4 Visual Aid) transparency, show a "before" image of a natural forest or forested area. Have students identify some of the organisms that might live in such a place and what these organisms use for food. List the suggestions on the board. Be sure students include both plants and animals. Ask prompting questions to review food chain and food web concepts.

Step 2

Display "after" images of a clear-cut forest and selectively logged forest using the **Before and After** transparency. Ask students what effects each method of logging may have on the plants and animals that naturally occurred in the area. Use prompting questions to stretch students to thinking beyond the immediate and obvious, such as "What might be happening downstream from this scene?" and "What alternatives might the animals living in this area have?" Discuss the advantages and disadvantages of each logging method.

Step 3

As a class, discuss wants versus needs in terms of consumption of forest resources. Ask students, "What alternatives do people have when it comes to using forested areas?" "What alternatives do plants and animals have when facing forest development?" *(People can be selective about where, what, and how much they build. Plants and animals have fewer alternatives, often summarized as move, adapt, or die.)* Discuss each of the following examples.

- freeways and trains to move through scenic areas *(Trains can move more people without using as much land.)*
- farming and ranching *(Mountain and forest land is generally not good for growing many crops, but it may be less expen sive than good farmland. Using other farmland might raise the price of some products.)*
- ski slopes *(There are many other forms of recreation that do not require the cutting of trees and installation of roads and buildings in the mountains.)*
- development of housing or shopping centers *(This building can be done elsewhere, but then that land would be altered, thereby affecting the organisms that live there.)*
- building a golf course *(Locating golf courses elsewhere would reduce the effects on the forests, but golfers would have to travel farther to golf. Discuss whether people need to have their favorite form of exercise available to them nearby.)*

Step 4

Write the following land-use changes on the board:

- build a mountain resort that includes tennis courts, an Olympic swimming pool, a game room, a hotel, restaurant, parking garage, and snowmobile rentals
- forbid logging in an area where endangered species live
- build a summer cabin development in a forest, including access roads and a sewage treatment facility

Organize the students into teams of four or five. Assign one scenario to each team. Several teams can work on the same scenario.

Give students 15 minutes to discuss and take notes on: (a) what resources would be consumed as a result of the land-use changes, (b) how the changes would affect plants in the area, and (c) how the changes would affect animals in the area.

Step 5

Introduce and discuss the concept that byproducts result from the human consumption of goods (matter) and that the effects of these byproducts on natural systems may be beneficial, detrimental, or neutral.

Step 6

As a class, have the students review the scenarios, then identify and describe the byproducts of each land use change. Write the byproducts on the board next to each of the land-use changes.

Lesson Assessment

Instructions

Description:

The EEI Learning Objective for Lesson 4 requires students to identify and describe byproducts generated by the human consumption of goods (matter) produced by natural systems (ecosystems). Students will demonstrate their learning by writing two questions that they, as a local citizen, would ask an individual or corporation petitioning for (requesting) a land use change in their neighborhood area.

Instructions:

For teacher:
Write the following instructions on the board and have students copy them onto a piece of paper or into their reflection journals: "Imagine a company that would like to use a part of the land in your neighborhood in a way that is different from how it is being used now. Describe that company and what it wants to do with or on the land. Write two questions that they would ask a company seeking permission to change how local land is going to be used in their neighborhood. Your questions should ask for information about byproducts and possible effects on the local natural systems.

Suggested Scoring

Scoring Method:

Answers will vary. Accept any reasonable answers. Each question must identify: The type of company and potential land-use change, discuss possible byproduct(s) that would result from the change; and, identify a possible effect on the local natural system.

Possible score for each sentence: Two points each for land-use change; possible byproduct(s) that would result from the change; and, a possible effect on the local natural system. Total point value: (12 points)

Examples:

(A paper company is asking permission to remove trees from a local hillside). When your company removes the trees near the river the process may result in a great deal of compressed soil? How will you prevent the change in the soil erosion around the river?

(A hotel chain would like to build summer cabins by a lake). How many cabins does your company plan to build? How will you take care of the trash made by the visitors so that the local wildlife stay healthy?